ERGONOMICS IN THE WORKPLACE

Please have a seat!
Mies Van Der Rohe (1886 - 1969)
Eero Saarinen (1910 - 1961)
Zaha Hadid (1950 - 2016)
Frank Lloyd Wright (1867 - 1959)
A CHAIR MAKER’S PERSPECTIVE

- Office Ergonomics
- Standards
- Construction
- Payback
WHY WE CARE

Musculoskeletal disorders (MSDs) cost employers over $80 BILLION ANNUALLY in America
BAD BACKS

• 25% of adults in the U.S. had back pain last month.

• Cost America over $85 Billion per year.

– Journal of the American Medical Association
Carpal Tunnel Syndrome

- Affects over 8 Million Americans.
- 250,000 surgeries are performed each year.
- 75% of victims cannot return to their profession after surgery.
- Surgery averages $47,000.
- True cost to the employer: medical x 5 (medical expense, lost time, administrative costs, temporary employee, retraining and/or disability)

– Bureau of Labor Statistics
– National Institute for Occupational Safety and Health
ERGONOMICS

The relationship between a person and their work environment.
YOUR TAKEAWAY TODAY

100°/100°/100°

Elbows and Eyes
THE IMPORTANCE OF SEATING

“I consider the chair the primary interface of a worker with the workstation. The chair has to be comfortable and adjustable to allow the worker to work in well supported postures. If the worker and the workstation are not aligned properly, the worker can adjust the chair to improve fit and alignment. If the chair can’t be adjusted, the worker will have to make the adjustment with their body. They often do this by using awkward postures and reaches.”

– Cindy Burt, MS, OTR/L, CPE
UCLA Ergonomics Program Manager
ANTHROPOMETRICS

The measurement of the size and proportions of the human body.
MEASURING JIG
What's your upper leg length? (in.)
DECEIVING BODY

TYPES

Who is taller?
DECEIVING BODY TYPES

How does it change their chair adjustments?
ADJUSTABLE TO ACCOMMODATE
THE STANDARDS

BIFMA

BIFMA G1-2013
ERGONOMICS GUIDELINE FOR FURNITURE USED IN OFFICE WORKSPACES DESIGNED FOR COMPUTER USE

ANSI
American National Standards Institute

HFES
PERFECT FIT IN ACTION
BAD ERGONOMICS IS EXPENSIVE!
MEASUREMENTS CREATE THE FOUNDATION FOR STANDARDS

Ergonomics

Anthropometrics

ANSI/HFES 100
BIFMA G1

100°/100°/100°
ANTHROPOMETRIC SURVEY OF U.S. ARMY PERSONNEL: 1988
5TH PERCENTILE WOMEN (SMALLEST)
95TH PERCENTILE MEN (LARGEST)
THE PROBLEM
10%

Simone Biles & Lebron James
“A chair, or chair with a combination of height adjustment mechanisms, should have a minimum seat height range 14.8 in to 20.2 in.”
POPLITEAL: THE REGION BEHIND THE KNEE

Popliteal

Popliteal Height:
Back of the knee to heel.
SEAT HEIGHT RANGE

5th percentile female lower leg = 13.6”  (13.6” + 1.2” heels = 14.8” seat height)

95th percentile male lower leg = 18.93”  (18.93” + 1.2” heels = 20.2” seat height)
SEAT HEIGHT PROTECTS THE WRIST

Proper elbow-to-worksurface height relationship.
THE CARPAL TUNNEL

“Carpus” - Wrist
SEAT HEIGHT PROTECTS THE WRIST

Tendons and Median Nerve
SEAT HEIGHT PROTECTS THE WRIST

The Median Nerve
SYNOVIA
NEUTRAL WRIST POSITION
NEUTRAL WRIST POSITION

Wrist flat, fingers hanging down
HYPEREXTENSION OF THE WRIST

Hands bending backwards
INFLAMMATION

Tingling, numbness, loss of strength
SEAT HEIGHT PROTECTS THE WRIST

Carpal Ligament Surgery
ELBOWS AT OR ABOVE KEYBOARD
PNEUMATIC CYLINDERS
ADJUSTABLE HEIGHT WORKSURFACE
ARTICULATING KEYBOARD TRAY (AKT)
FLAT CHAIR BASE VS. ARCHED CHAIR BASE
FOOT RESTS
FOOTRING

90°
ULNAR DEVIATION
RUBBING
SHOULDER ADDUCTION TO REDUCE WRIST PAIN
WRIST STRETCHES
BIFMA G1

SEAT DEPTH
UPPER LEG 5TH PERCENTILE
FEMALE
FEMORAL VEIN
FEMORAL VEIN

- Swelling
- Cold Sensation
- Varicose Veins
TOO DEEP, NO LUMBAR SUPPORT
WATERFALL FRONT
FEMORAL VEIN
CIRCULATION

Seat is too deep.
Hits the back of the leg.

Seat is too short.
Not enough thigh support.
SWEET SPOTS
“THE SITTING BONES”

Ischial Tuberosities
“FANCY” DERRIERES
LONG LEGS
SEAT PRESSURE MAP
TRADITIONAL FOAM
GEL SEAT
MESH SEAT
PRESSURE MAP COMPARISON

Foam Seat

Gel Seat

Mesh Seat
CUT FOAM VS. MOLDED FOAM
CUT FOAM
MOLDED FOAM
CUT FOAM VS. MOLDED FOAM
SKIN FOR FABRIC ADHESION
BIFMA G1

Lumbar Support
LUMBAR SPINE

Don’t round out!
Kyphosis = 😞

Keep lumbar curve.
Lordosis = 😊
HUMAN SPINE

- Cervical Vertebrae
- Thoracic Vertebrae
- Lumbar Vertebrae
- Sacrum
SPINE COMPONENTS

Vertebra

Spinal Nerve

Disc
SCIATIC NERVE

- Cervical Vertebrae
- Thoracic Vertebrae
- Lumbar Vertebrae
- Sacrum

L4 + L5
SCIATIC NERVE
(L4 + L5)
NATURAL PADDING: HIGHER LUMBAR
LOSS OF MUSCLE MASS
Why did she say your best days appear to be ahead of you, but my best days appear to be behind me?
HFES-100

SEAT PAN ANGLE

“… should fall from 0° (horizontal) to 4° rearward.”
SEAT PAN ANGLE

0° (Horizontal) to -10° (Rearward) is good!
ARMRESTS

“armrests can support the muscular system of the neck and shoulder and aid in standing up and sitting down”
ARMRESTS...

- Assist with standing up.
- Give relief to neck and shoulder muscles.
TORSO LENGTH & ELBOW HEIGHT DETERMINE ARMREST HEIGHT.
CERVICAL SPINE
GLASSES?
MONITOR ARM
HEADRESTS
DOMINANT EYE
COPY PLACEMENT
MOST IMPORTANT PIECE FOR NECK HAPPINESS ($200)
“My screen is hard to read. Can I have a bigger monitor?”
TECH NECK

60° 60 lbs.
45° 49 lbs.
30° 40 lbs.
15° 27 lbs.
0° 10 – 12 lbs.
NECK STRETCHES
MOVEMENT

The best posture is the next posture!
COMMON CHAIR CONTROLS

• Asynchronous
• Tilt swivel
• Knee hollow
• Synchronous
ASYNCHRONOUS
TILT SWIVEL
KNEE HOLLOW TILT
SYNCHRONOUS
FINE-TUNE BACKREST ANGLE
SLOUCHERS + PERCHERS
The Right Posture:

100°/100°/100°

Elbows and Eyes
TYPICAL WORKING POSTURES

Rearward Posture  Upright  Forward Tilt  Standing
“SITTING IS THE NEW SMOKING”
- Dr. Levin
CAL BERKLEY

STAND 15 MINUTES / HR. MAX
TORONTO STUDY

American Journal of Epidemiology, Institute of Work and Health 2012
THE PROBLEM WITH DESKTOP DEVICES

BOUNCY KEYBOARDS

LOSS OF DESKTOP REAL ESTATE

AWKWARD POSTURES WHEN RAISING AND LOWERING

HIGHER KEYBOARD IN THE LOW POSITION
THE RIGHT EQUIPMENT

• Chair – Fully adjustable and complies with ANSI/HFES 100.

• Keyboard Height Adjustment – Either work surface or articulating keyboard tray.

• Monitor Arm – If needed.

• Headrest – Very important!
STATE OF ARIZONA
ANTHROPOMETRIC CS IN ACTION
65,989 CHAIRS
313 SPECIAL TALL SEATS +
1,549 SPECIAL SEAT DEPTHS
32 NARROWER SEATS +
72 SPECIAL LOW SEAT HEIGHTS +
1 LITTLE PERSON CHAIR
25% OF CHAIRS WERE “INDIVIDUALIZED”
ONE SUPPLIER DOESN’T DO IT ALL
STATE OF ARIZONA

• Injury rate for Arizona employees, wrist and neck compared to other states

40% LESS!

– Bureau of Labor Statistics
– US Census Bureau, Center of Disease Control, 2010
STATE OF ARIZONA

• Average cost of just one injury (medical expense, lost time, administrative costs, temporary employee, retraining and/or disability): $211,600.

• The state spent $1,672,378 less than other states (20 vs 34 injuries/10,0000)

• Total spent by the state on Sitmatic chairs: $368,863.

• THE SEATING WAS FREE 4 TIMES OVER!
  – Bureau of Labor Statistics
  – US Census Bureau, Center of Disease Control, 2010
ERGONOMICS
PAY
SO, DO YOU THINK THE PAIN IN YOUR SHOULDER IS ALL IN YOUR HEAD... OR, IS THE PAIN IN YOUR HEAD ALL IN YOUR SHOULDER?

BILL GETS HIS ANNUAL METAPHYSICAL
VOCAB WORDS

Back of the knee: Popliteal
Butt bones: Ischial Tuberosities
Fat: Adipose Tissue
Measurements of the human body: Anthropometrics
Relationship between man & his working environment: Ergonomics
Your takeaway today:

100°/100°/100°

- Elbows and Eyes
THANK YOU FOR JOINING US!

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CREDITS

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